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WHEN SHALL WE ADVISE TYMPANOMASTOID EXENTERATION IN THE TREATMENT OF SUPPURATIVE OTITIS MEDIA, AND IN WHAT PERCENTAGE OF CASES MAY WE EXPECT A CURE?[1]

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During recent years the prognosis of suppurative middle-ear disease, including all of its complications and eventuations, has very materially improved. A better realization of the importance of the disease has led to its earlier and more persistent treatment, and antiseptic surgery has enabled the aurist to save the lives of many persons whose conditions a few years since would have been looked upon as hopeless. Of perhaps more importance is the fact that surgical improvements have put it in the power of the aurist to prevent many of the serious complications of this disease.

A purulent imflammation of the middle ear may persist for many years without causing serious disturbance of health or destruction

[1] Read at the meeting of the Southern Section of the American Laryngological, Rhinological, and Otological Society, at Louisville, Kentucky, February 25, 1907.

of any tissue beyond the confines of the tympanic cavity. On the other hand, it is becoming generally recognized now that the mere existance of such a purulent focus is a constant menace to the health and life of the individual bearing it, and that at any moment it may flare up into an active process which will be extremely difficult to check or control.

I suppose it may be taken for granted that this Association would recommend the persistent treatment of every case of purulent otitis media until cured, employing the simplest measures possible as long as they give promise of effective results, but resorting to surgical intervention whenever required to overcome an obstinate otorrhœa. Without at all exaggerating the possibility of dangerous complications or sequels ensuing from direct extension of suppuration, from the tympanum to neighboring vital structures, we are safe in saying that no person who is the subject of a purulent discharge from the middle ear should be permitted to look upon his condition as one without danger to life. Aside from the risk of the graver consequences attending purulent invasion of the mastoid process, the soft tissues of the neck, or the cranial cavity, we must remember that the victim of chronic otorrhœa is suffering a steady drain upon his supply of vitality and that in addition to this fixed charge against his resources he carries an undeterminable, yet constant, risk of secondary personal infection and an incubator for bacteria to supply contamination to his neighbors.

It becomes our duty, therefore, to teach the family physician and the public to recognize the fact that purulent otorrhœa is a symptom of a disease which has a most important bearing upon the patient's continued enjoyment of health and life; that it demands immediate and continuous treatment until a cure results, inasmuch as it is susceptible of cure in almost every instance; and that, while we sometimes speak of the measure which is employed as a last resort in the treatment as "a radical operation," it is not *radicalism* but *conservatism*, which demands surgical intervention in chronic suppurative otitis media when other means of treatment have failed of effect.

The prognosis of suppurative otitis media, when properly treated, is extremely good. The majority of all acute cases respond promptly to proper local medicinal measures. By such treatment is meant simply the procuring of free drainage of excretions from the tympanum and the maintenance of as perfect cleanliness of that cavity as is possible. But, in spite of the early institution of skilful treatment, some cases appear to be in the very nature of things destined to pursue a chronic course. This tendency to chronicity may be the result of excessive activity on the part of the infective agent, of inability on the part of the patient to respond to reparative processes, or of peculiar anatomical conditions or pathological alterations which favor the extension or persistence of the necrosis. General

hygienic care and tonic treatment, supported by patient, well-directed, and persevering efforts to sterilize the tympanum, will render the invading foe innocuous and bring about a cure in the large majority of this class of cases.

Neglect is perhaps the greatest factor in the causation of chronic purulent otitis media. Ignorance of the character and dangers of the disease, reliance upon home treatment, carelessness in the employment of remedies and measures properly recommended by the physician, or the use of agents better fitted to excite than to allay purulent inflammation, are among the factors we frequently have to blame for the existence of a chronic otorrhœa when first it comes under our notice. But even these chronic cases have a very favorable prognosis when brought under proper treatment, for it has been demonstrated that taking them as they come, and including cases of many years' standing, fully one-half will recover under simple drainage and antisepsis.

Something less than 50 per cent., then, of the chronic suppurative otitis medias will require the consideration of some more energetic measures, such as surgical assistance, for the removal of polypoid tissue or necrotic ossicles through the external auditory canal, or the more extensive surgical intervention embodied in the so-called radical operation. Ossiculectomy, intratympanic curettage, occlusion of the tympanopharyngeal tube by a flap from the tympanic membrane, and removal of the tympanic scute through the external canal are simpler surgical measures which promise satisfactory results in some cases. It is surprising what a large percentage of the very worst-looking cases will respond satisfactorily to the exhaustive employment of painstaking measures to cleanse the tympanum of debris and free it of infective material. If due care is exercised in diagnosticating the factors accountable for chronicity in each case and conscientious efforts made to remove or overcome them, efforts which shall be continued patiently and perseveringly over a period of several weeks or months if necessary, according to the circumstances attending the particular case, I believe but a small minority of even the chronic otorrhœas will require the operation of tympanomastoid exenteration. It seems to me this operation is properly to be held in reserve as a last resort for those cases which do not succumb to milder forms of treatment, but that, while an honest effort to procure healing by simple measures should precede consideration of surgical attention, indefinite prolongation of such treatment is not justifiable; and the fact that serious complications have not supervened does not excuse interminable delay. Not all cases are cured even by the radical operation, but the vast majority are; and so, only an insignificant percentage of the whole number of otorrhœas is left unhealed after thorough treatment. That this small proportion will steadily decrease in the future as the technique of the major operation improves in the hands of the mass of operators, is to be expected.

Nothing has been said regarding those cases of either acute or chronic otitis media in which positive evidences of mastoid or cranial invasion are present, it being assumed that all are agreed upon the necessity for prompt operative intervention as the only safe form of treatment, and that the operation of complete tympanomastoid exenteration should be performed if necessary in order to ablate the disease. It is the object of this paper to consider more particularly that large group of chronic suppurative otitis medias in which the predominant symptom is otorrhœa, and in which no serious complications have arisen. Concerning these cases, if we admit the fairness of the prognosis stated above and accept, as a foundation for determining the treatment to be selected, the belief that while most cases can be cured by drainage, antisepsis, and middle-ear operations a small number will require the major operation, and that this operation is not only a justifiable procedure, but should, as a rule, be employed rather than permit the disease to continue, it becomes necessary to consider the following questions: (1) What are the indications that justify tympanomastoid exenteration? (2) What are the dangers and risks of the operation as compared with the disease untreated? (3) What may we safely say to the patient regarding relief from the otorrhœa and the restoration of function?

1. *What are the indications for tympanomastoid exenteration in the treatment of chronic suppurative otitis media, without evidences of mastoid or cerebral complications?*

Purulent otorrhœa is, perhaps, the single symptom complained of, and, assuming now that other forms of treatment have been properly tried and have failed to control this discharge, we must be guided by a study of the excretion, the determination of the pathological lesion within the tympanum, and the patient's general physical condition. Ascertaining the nature of the bacteria present in the pus affords very little if any assistance, but such investigation should always be made. As a rule the infection is a mixed one. When streptococci are present in considerable numbers we may bear in mind the especially virulent character of this organism, but it is not safe in any given case to look upon the diplococci or staphylococci as less dangerous. I have seen a fatal result in one case of pure infection by Staphylococcus albus, an organism that is looked upon as comparatively innocent. Of much more importance is the discovery of bone-dust or epithelial cells in the excretion. If the washings from the tympanic cavity be centrifugalized and the sediment, under microscopic examination, shows particles of bone structure, we have positive evidence of bone destruction going on, and this is one of the strongest reasons that can be urged for operation. Likewise, the finding of epithelial cells in the pus or in the washings warns us of the possible presence or formation of cholesteatomatous masses, and, if in addition cholesterin crystals

are discovered, we have positive assurance of the existence of a dangerous element. These features of the microscopic investigation are the most important single elements in determining the advisability of surgical intervention.

As regards the gross pathological changes in the tympanum, very little information of prognostic value can be gained from their inspection. Lesions of the internal wall can rarely be made out because the disease, when it does spread in that direction, most commonly passes through the round window or, less frequently, through the oval window after erosion of the foot-plate of the stapes. Pus exuding from the oval window or from the promontory, particularly if it rapidly reappears after being wiped away, is positively diagnostic of labyrinthine invasion, and the appearance of granulation tissue springing from the inner tympanic wall, with roughened carious bone underneath, is characteristic of necrosis of the labyrinthine capsule. Tinnitus and vertigo accompanying purulent otitis media, with or without the objective evidences of labyrinthine disease just referred to, while not affording conclusive proof of the extension of purulency, are sufficiently suggestive to justify an exploratory operation and this should always be in the nature of a complete tympanomastoid exenteration. When dealing with large polyps which protrude into the external auditory canal we may well consider the advisability of attempting their removal by a simple snaring operation, to be followed by appropriate local treatment, or the performance at once of the radical operation. Such growths almost invariably spring from an area of carious bone the extent of which disease cannot be prejudged. Forcible evulsion has not infrequently been followed by serious complications; the tearing away of a sequestrum, opening up healthy tissue to the pyogenic organisms which seem to become remarkably active after perhaps a long period of lethargy. If it appears that the polyp has its attachment to the roof of the tympanum or its internal wall, it is probably wiser either to make its removal part of an exenteration operation or to inform the patient that such an operation may soon become necessary. I am, personally, inclined to look upon a middle-ear polyp, whose base I cannot accurately decide to be situated in a comparatively innocent site, as sufficient reason for recommending the radical operation. When a polyp is removed in this way the operation can be completed satisfactorily, the entire suppurative process probably be disposed of at the same time, and the operator has better control of the situation for the prevention of future complications.

Another visible evidence of extratympanic purulency is the finding of pus trickling down over the internal wall from the region of the additus ad antrum. This affords a strong inference of antral infection, and as irrigation is presumed herein to have failed, proper drainage can be secured only by operation through the

mastoid. In those cases of suppurative otitis media in which the ossicles are still present, though possibly diseased, we have naturally to consider the relative merits of middle-ear operations through the canal and of complete exenteration. It is scarcely within the province of this paper to discuss that matter, though some mention of it must be made. It was understood as a premise that, whenever clearly applicable, simple middle-ear operations would be given preference over the more extensive major procedure. Naturally there will arise a series of cases wherein opinions would differ as to the applicability of the several operations. I can imagine one surgeon advocating radical measures while another of equal ability and professional prominence would in the same case prefer to try, first at least, ossiculectomy. It is conceivable also that the latter might secure a cure in some of these cases. Consequently there is room for much honest difference of opinion in the selection of cases. The conservative ground to occupy would seem to be a preference for the radical operation only when granulomas, epithelial cells or bone-dust in the pus, or clinical symptoms of extension of the disease beyond the confines of the tympanic cavity point to the necessity for some operation more thorough than can be performed through the canal.

Occasionally the patient's general state of health may be a determining factor in the decision to operate. Just how much influence a chronic purulent otitis may be exerting upon the general system it is always difficult to say, but it is reasonable to suppose that sufficient toxins may be absorbed from the tympanic disease to prove a seriously disturbing obstacle to the growth and development of a child or to cause a decline in the vitality of an adult. It has seemed to me that this possibility has too seldom received its meed of consideration. When considering the indications for operation I should be, therefore, more strongly inclined toward intervention if the patient's general physical condition was below par than if the patient were robust, other things being equal.

2. *What is the prognosis of the operation itself? What are the possible dangers of the operation? How do these risks compare with those of the neglected disease?*

Under the head of prognosis we should consider: (*a*) The question of mortality; (*b*) deformity of the face; (*c*) failure to cure the condition for which the operation is performed, and (*d*) further impairment of the hearing.

(*a*) Any operation which requires the preliminary institution of anesthesia is, of course, attended by the possible mortality of the particular anesthetic employed. As anesthetics are given today in the best hospitals, this danger is reduced to the lowest calculable point, and is so small as be practically a negligible quantity; though the patient or his guardians should always be informed that death from anesthesia is a possibility. In view of the fact that it is generally

impossible prior to operation to ascertain with any degree of accuracy the extent of the necrosis, and recognizing also the fact that some of the most careful clinical observers have disclosed at operation complicating lesions which were entirely unsuspected, we must admit the possibility of some few fatal results from the excitation of latent purulent foci or from the coincidence of having operated at the moment when an otitis media was breaking into vital structures. But has the operation any mortality *per se?* Theoretically, one would be inclined to answer this question in the negative, but, practically, it seems impossible to do so. The region attacked is one where a slight error in technique may be followed by serious consequences, and few of us will claim infallibility. A very small number of cases, yet sufficient to demand consideration, have been reported in which death followed the operation without explainable cause. At the 1904 meeting of the American Otological Society, Jack reported a death after operation, for the relief of otorrhœa, upon a particularly robust and healthy man, and Harris spoke of a similar instance occurring in the practice of Dr. Toeplitz. The fact that but few fatal results have found their way into otological literature does not prove their infrequency, but there is no apparent reason for assuming, as some have, that a sufficient number of fatalities have occurred to give the operation an appreciable mortality.

Zeroni,[2] in a most interesting and instructive article on Postoperative Meningitis, reports a critical analysis of 40 cases of death following this operation for the cure of otorrhœa, which he has been able to find in German literature. Careful postmortem examination showed that in 29 there had existed an unsuspected labyrinthine disease, in 10 there was a latent meningitis or extradural abscess, and 1 remained unexplained. This argues the necessity for a more careful search for these deep-seated conditions in cases which we propose to submit to operation. He believes the operation less dangerous than the disease, because a study of these autopsy materials convinced him that most of the cases were steadily progressing to a serious termination and would have inevitably ended fatally had no operation been performed.

(*b*) Since almost all operators now seek primary closure of the mastoid wound in this operation we may pass any consideration of the deformity from postaural openings. The only deformity of an annoying character that may result is that of facial paralysis. Even the most skilful operator, taking every precaution to protect the nerve will occasionally have a paralysis following this operation. When such an unfortunate sequel results we should be slow to impute carelessness or clumsiness to the surgeon. The mere exposure of the nerve sheath to the atmosphere, to infection, or to pressure from the dressings may cause a neuritis or a paresis, and I believe that is

[2] Archiv f. Ohrenheilk., December 15, 1905, p. 199.

often the explanation of those cases in which the appearance of the paralysis is delayed for from twenty-four to forty-eight hours after the operation. Touching the nerve with the instruments is, of course, the most probable cause of the majority of these accidents, but unless the nerve is grossly injured the chances of recovery are good. Complete severance of the nerve or gouging out a portion of it may result in permanent loss of function. The simpler traumatisms or irritations produce only temporary loss of power. In spite of the belief in a good prognosis, one nevertheless views a postoperative facial paralysis with distress and apprehension.

(*c*) Complete cure of the suppurative otitis media does not always result from a satisfactory exenteration. With the best and most experienced operators there still remains a high percentage of failures to cure otorrhœa by this operation. Satisfactory statistics are difficult to arrive at, partly on account of the varying basis on which the indications for the operation are placed. Thus the surgeon who employs the operation for nearly every case of chronic suppurative otitis may be expected to show a higher percentage of cures than one who performs exenteration only in those cases that have been first subjected to every other form of treatment without avail. It may be said also that so far there have been very few statistics published from which conclusions might be drawn. Some of the most prominent surgeons making such reports, and who probably operate only when other forms of treatment would not promise good results, are the following: Stacke has reported 37 cases operated upon with 27 cures (73 per cent.); Panse 57 cases with 31 cures (54 per cent.); Grunert 43 cases and 24 cures (55 per cent.); Poli 40 cases with 32 cures (80 per cent.); and I recently heard Dr. Dench say, in a discussion of this subject, that while in the first hundred cases he had only about 70 per cent. of successes, in a second series of cases about 80 per cent. of cures had resulted.

(*d*) The effect upon the hearing is a question invariably asked by the patient, but I am not sure as to how much consideration it deserves. Conservation of the hearing or of a fractional portion of it has a different value for different individuals. A great many people might be deprived entirely of the function of one ear without being seriously handicapped in their business or social relations. On the other hand, persons whose condition demands acute hearing power can ill afford to lose any or, having lost some by disease, must avoid risk of its further diminution; particularly is this true when both ears are involved. We have all seen cases of extensive destruction of the membrane and ossicles, with persistent otorrhœa, in which the hearing remained nearly normal. In such a case, unless there is some urgent reason for operating, it is quite proper to estimate the possibilities of further impairing the function of the organ. In the attitude I have taken, of recommending operation only in those cases of extensive middle-ear disease, in which other treatment has

failed, the hearing power is usually a negligible quantity and occupies a minor place in the consideration of operative treatment.

A few operators have claimed remarkable improvement of hearing following operation in some cases, but as nearly as I can estimate it we are not, as a rule, justified in promising or expecting improvement in the hearing and in many cases will find that it is impaired by the operation. Should we be so fortunate as to eradicate the disease and secure a healthy skin lining for the new cavity formed by the junction of the antrum, tympanum, and external auditory canal it is quite probable that in the majority of instances this very process of epidermization, which contributes to the success of the operation, adds something to the impairment of motion of the stapes. The better the mobility of that ossicle prior to operation the more likely is it to suffer from this cause. It is perhaps only in those cases in which the stapes is firmly fixed by fibrous tissue that the operation improves its ability to respond to sound waves, by liberation from the restricting bands.

How do the risks of the operation compare with those of the disease? It is impossible to make a satisfactory comparison inasmuch as accurate statistics are not obtainable on either side. I have stated my belief that the operation is not very dangerous to life and that most of the deaths that have followed the operation have occurred from some complication previously existing, though unsuspected, rather than as a direct result thereof. Neither can the dangers of the disease be stated explicitly in figures. We all know, however, that the majority of purulent affections of the brain have their origin in neglected otitis media and that many cases of infective enteritis and fatal bronchopneumonias, especially in children, originate from the same source. A most significant fact to be remembered in this connection is that no reputable life-insurance company will take a risk upon an individual who is or has recently been the subject of a purulent otorrhœa. The business man's estimate of such risks is worthy of consideration, at least it may have more weight with the lay mind than any medical argument. In a very instructive paper by Whitehead[3] on the complications of temporal bone disease, based upon a study of the work performed at the General Infirmary at Leeds, England, during the last fifteen years, I find the following significant statement: "There was an antecedent history of chronic otorrhœa in 21 out of the 33 cases of meningitis; in 17 out of the 20 cases of sinus thrombosis; in 20 out of 21 cases of cerebral abscess; in 13 out of the 15 cases of cerebellar abscess, and in 1 out of the 2 cases of combined cerebral and cerebellar abscess." This comes from a general hospital where patients were not admitted previously because of ear disease.

In conclusion, viewing the question from these various stand-

[3] Archives of Otology, 1906, xxxv, No. 5.

points, I would formulate the following rules for guidance when considering the treatment of persistent chronic suppurative otitis media:

1. Broadly speaking, practically every case of suppurative otitis media is assumed to be susceptible of cure by one means or another.

2. Every case of chronic suppurative otitis media, without symptoms of intracranial invasion, should be treated patiently and persistently for a reasonable length of time, but not indefinitely, by well-directed efforts at cleanliness and antisepsis through the external auditory canal. When it becomes evident that these simple measures or minor operations cannot cure the disease, tympanomastoid exenteration should be advised unless in a given case there exists some special reason of socio-economical character that justifies delay and the risks of the disease.

3. The clinical evidences of an inveterate purulency that may help one to decide the question of when to recommend operation are: the finding of cholesteatomatous masses, epithelial cells, or bone-dust in the washings from the middle ear, the tracing of the source of pus to the mastoid antrum or labyrinthine capsule, or the existence of granulomas springing from carious areas of the tympanic wall which cannot be directly inspected and treated.

4. The possible dangers of the operation are believed to be far less than those of the disease.

5. The patient should be told that not every case is curable, even by an operation (the percentage of cures in the obstinately chronic cases probably approximating 70 per cent.), that the hearing power will probably not be improved and may be somewhat impaired, but, that the serious nature of his disease warrants surgical intervention as a prophylactic measure.

6. Every patient upon whom an operation of tympanomastoid exenteration is contemplated should be most carefully studied for a considerable period of time, in order that the slightest evidence of latent meningitis or purulent labyrinthitis may be detected, and when there exists any reason to suppose that the disease has extended beyond the bounds of the tympanic cavity the patient or his guardians should be told that an element of danger attends the operation. The possibility of postoperative complications cannot be ignored and the surgeon must safeguard himself.